Designing Emotional Content into the Mouthfeel of Food

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Designing Emotional Content into the Mouthfeel of Food

By

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Dedication

This thesis work is dedicated to my husband, Rayan, who has been a constant source of support and encouragement during the challenges of graduate school and life. I am truly thankful for having you by my side during this journey. This work is also dedicated to my son, Elyas, my parents, Khalid and Abeer, and my siblings, Amro and Lara. You have all loved me unconditionally and you taught me to work hard for the things that I aspire to achieve.
Abstract

Processed foods may lack nutritional value; however, they are inexpensive, convenient, and highly palatable or satisfying to consumers. All of these factors impact the relationships we have with food. One of the reasons why processed foods are enjoyable is the variation of sensorial qualities it provides. Our senses facilitate our connection with food, we observe the color and form visually, we examine the texture with our hands and mouth, we hear the crunch of a crispy chip. All of these factors are considered in the realm of food design. Designers can contribute to this area by applying the Design Thinking process used to design an object to designing food, through exploring physical attributes, mouthfeel, and aesthetics of food. Providing designers with a chance to positively affect human food preferences, which can lead to the creation of more desirable, healthy food products. Designers in the food industry had not applied design Thinking until 2017.1

Keywords

Food Design, Mouthfeel, Texture, Food Preferences, Sensorial Exploration.

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**Issue at hand**

“The nature, extent and purpose of food processing has been revolutionized as an intrinsic part of industrialization.”

Food production has increasingly focused on creating food that is palatable, convenient, inexpensive, at the expense of their nutritional value. “These shifts have been accompanied by dramatic increases of obesity and related chronic noncommunicable [sic] diseases, most notably diabetes, at first in high- and middle-income countries, and now also in lower-income countries.” With these shifts occurring, people are now trying to take charge of their health, seeking food that has greater nutritional value than processed foods, while providing some of the physical attributes that are usually experienced when eating processed foods. As humans, we develop relationships with our food. Whether these relationships are positive or negative, they influence our food preferences as they are created. Food design is an emerging field that acts as “an umbrella concept with which professionals from different backgrounds can identify”, providing designers an opportunity to play a major role by creating positive food experiences.

**Emotional Experience (Relationships with Food)**

Many factors play a role in human’s relationship with food, starting from infancy all the way into adulthood. Some key factors are sensory experiences, economics, parental influence, culture, and perception of healthy food.

**Parental Role**

With busy and full schedules, it can be hard for working parents to provide meals that are appealing, and nutritious to children. Exploring a variety of foods can also be difficult, this can lead to children being less exposed to the sensorial qualities of different foods. Furthermore, the lack of variety reduces the familiarity of children to certain foods, and the less familiar they are with food, the less likely they will eat it.

**Culture**

The cultures we are born into play a major role on the food we tolerate or prefer. For example, “many who are used to Western-style food might find a silky tofu made from soy milk unappetizing and jellylike, but enjoy a sweet pudding or cheese made from milk with exactly the same texture, judging it to be soft and delicious.”

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2 Monteiro, C A, J C Moubarac, G Cannon, S W Ng, and B Popkin. "Ultra-processed products are becoming dominant in the global food system." Obesity Reviews, 2013, 21.
3 Monteiro, "Ultra-processed products," 22
Convenience

With the fast pace of modern life, consumers are relying more on quick and convenient food options. This has led to drastic changes in consumers eating habits. “As societies become more urbanized, as available income grows and as the proportion of women employed outside the home increases, ready-to-eat and ready-to-heat food products become convenient and attractive choices.”

Enjoyment

“Fundamentally, we are driven by desire and drawn by enjoyment. Eating is a hedonistic activity. We eat what each of us thinks tastes good.” For example, people are more likely to find pleasure in eating a crunchy chip versus a vegetable puree. The puree will probably have a higher nutritional value, but based on sensory qualities of both, the chip has more to offer such as bubbles or blisters (Figure 1).
What is Food Design?

“Food Design is, simply, the connection between food and Design. Food Design is the design process that leads to innovation on products, services or systems for food and eating: from production, procurement, preservation, and transportation, to preparation, presentation, consumption, and disposal. Food Design is the process that brings deliberate and reasoned innovation of function, technology, or meaning on anything that has to do with food or eating.”\(^9\) The subcategories of food design can be seen in (Figure 2)\(^{10}\).

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Food design is a relatively new area of study. “The desire for change in the contemporary food system is not the only inspiration behind the development of the new and inherently transdisciplinary field of food design. According to the definition proposed by Food Design North America (an association dedicated to expanding the understanding and promotion of food design in North America, which welcomes both professionals and researchers), food design includes ‘any action that can improve our relationship with food individually or collectively.’”

**Food Design Thinking**

“Food Design Thinking can be conceptualized as the process by which food designers transform knowledge and ideas derived from food science, food psychology, and food culture into creative solutions.” This approach (Figure 3) does not only benefit designers, but also professional in the culinary world. “A better understanding of how idea generation processes work in Food Design would be invaluable in teaching novice chefs how to successfully innovate in a workplace too busy and competitive to tolerate failed culinary experiments.” It is an interdisciplinary field that bridges different areas of knowledge.

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11 Parasecoli, “Food, research, design,” 19.
12 Zampollo, “Food Design Thinking,” 203.
14 Zampollo, “Food Design Thinking,” 204.
**Multi Sensorial Exploration with Food**

“What makes foods remarkable as aesthetic objects is that people use all the different sensory modalities in the interaction with food products”\(^\text{15}\). Before we begin eating a plate of food, we first look at it, we smell the aroma coming from it, we might also interact with it through touch to experience the texture. The more senses involved, the more engaging that experience will be.\(^\text{16}\) Humans are mostly multimodal, which means we use our senses together in order to inform our behaviors\(^\text{17}\), as depicted in (Figure 4)\(^\text{18}\).

![Human Modality](image)

**Figure 4**

The first step is sense. When it comes to eating, we use our senses to tell us about the food that is plated in front of us. Based on how successful or unsuccessful our sensorial interactions are, we determine whether or not we want to eat the food provided. However, if the food is disliked, children are still able to learn pleasure from the sensory properties of the food.\(^\text{19}\) Therefore, it is important that children are exposed to different foods even if they are disliked, as that pleasure can change their behavior towards certain foods. To explore how sensorial exploration can affect humans’ decisions when it comes to food, I will examine the following areas:

**Visuals**

“It was Apicius, the 1st Century Roman gourmand who purportedly coined the phrase “we eat first with our

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\(^{16}\) Schifferstein, "What design can bring to the food industry," 125.


eyes.”

Visuals of food can be experienced in person, at a restaurant, or walking through a grocery store. They can also be experienced virtually through screens, whether that is a phone screen or a television screen. Many of these representations are unrealistic and make them seem more appetizing than they actually are. The way food is presented or plated not only impacts human’s flavor perception, but it can also alter food choices and change consumption behaviors.

**Color**

When it comes to food, certain colors are more disliked than others. For example, green vegetables are rejected more often and are less accepted than orange foods. Another color that can lead to negative perceptions is the color brown. Some people perceive brownish food as burnt flavor or a dry texture while others perceive it as a tasty caramelization experience (Figure 5). Moreover, some cooking processes, such as boiling without blanching, can lead to food that

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21 "Eating with our eyes: From visual hunger to digital satiation," 55.


appears to have lost its color saturation, leaving an underlying grayish tone. This makes food less appealing and less likely to be eaten.

**Shapes**

“The shape and morphology of the food are also physical attributes that are of great importance to the visual aspect of the flavor experience. For example, the appearance of a large round apple, a small knobby walnut, a transparent piece of jelly, or some cocoa powder all lead to different expectations.”

One method that is used with children is cutting fruits, vegetables and even sandwiches into shapes that are familiar to the child. Familiarity is an important factor in making eating decisions. For example, many children are attracted to crackers that have familiar shapes such as animals and goldfish.

**Texture**

Food texture can be visually perceived, touched by hand, or felt in the mouth. “If the brain sends a positive signal, but before the food is allowed to enter the actual oral cavity and stay there, it is next judged by physical contact with the lips, which sense its temperature and other characteristics, such as coarseness. All still being well, we put the food into our mouth, where the tongue and the inside of the mouth are ready to trigger a whole cascade of mouthfeel sensations.”

Exposing children to different textures early in life may increase the chance of accepting more complex textures later in life.

Next, I will discuss three types of textures, which are visual, tactile, and mouthfeel.

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Visual Texture

The first interaction a human has with food is visually. It has been proven that vision is more important than touch in the process of sensory decision-making in children\(^\text{27}\). If the food has an unfamiliar or unappealing texture such as bits, pips, coarseness, or gooiness (Figure 6)\(^\text{28}\), it can result in a decision to not get that food to the next step, which is touching.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{image}
\caption{Figure 6}
\end{figure}

\begin{thebibliography}{1}
\bibitem{Lafraire}
Lafraire, "Food rejections in children," 349.
\bibitem{OleMouritsen}
\end{thebibliography}
**Tactile Texture**

Contingent on the successfulness of the visual evaluation, tactile interaction with food will occur. An area that seems to rarely fail when it comes to physical contact with food is hardness or crunchiness. By touching food we can perceive whether it’s going to be crispy, greasy, or soggy, French fries would be an example of this. If we enjoy crispy French fries and we find that they are soft when we touch them, this can lead to a flavor perception that is disliked. We might think that the fries are stale and have changed in flavor.

**Mouthfeel Texture**

Mouthfeel plays an important role in how we perceive the taste or flavor of food. Once food is in our mouths, it can change based on chewing, or from chemical/physical changes due to temperature and saliva, such as a bite of meringue that melts in your mouth (Figure 7).

![Figure 7](image)

We can also determine if it is thin or thick, moist or dry, crunchy or chewy. When food is hard to bite, it requires more effort from the user. On the other hand, if the food is soft, it will be easier to chew, which might make the user accept it more.

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Designers Role in Food Design

Design is very important in understanding and interfering in different aspects of food systems, whether it is cutlery design, food product design, or food space design. A designer who works with food is a kind of connector between a farmer and a mother who feeds her child.

It is clearly portrayed in (Figure 8) that designers are the main integrators of information that is provided from various disciplines. This suggests that designers have a different approach to the challenges faced because they receive information from different disciplines, which they then integrate into a solution. One factor that makes designers’ approach different is their knowledge of design thinking. “Studying Design Thinking helps build a better understanding of how the most successful designers identify relevant needs and develop products that satisfy them, an understanding which can then be applied by other designers, enabling them to find solutions more efficiently and generate more creative ideas.” Designers in the food industry had not applied this approach until 2017. When a designer’s thinking is combined with a scientific thinking many unique solutions can be achieved. A scientist may sift through facts to unravel patterns and insights; the designer will then use these insights to invent new concepts.

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33 Parascenol, “Food, research, design,”19.
34 Schifferstein, “What design can bring to the food industry,” 117-118.
36 Schifferstein, “What design can bring to the food industry,” 118.
37 Zampollo, “Food Design Thinking,” 203.
38 Zampollo, “Food Design Thinking,” 203.
Creating Healthy Relationships with Food

User experience has always been a primary objective for designers. We strive to create experiences that leave the user with a positive impact. An important area where user experience is very important is designing food. Food design allows designers to create for the user, not only to enhance their experience, but most importantly their quality of life. “Whilst emotional design is most frequently applied to the development of processed food products that are not conducive to health, less is known about how these concepts could be applied to healthful foods.”

Food as a Material

“Foods are interesting materials for designers in order to learn how to sculpt, build and shape objects, and to develop their sensory sensitivity.” There are many benefits to using food as a material, it allows for “a rapid, iterative process of developing concepts through preparing, cooking, testing, evaluating and adjusting.” Subtle manipulations to these materials can produce rewarding outcomes. Also, because food is a material that humans interact with on a daily basis, it makes it easy for designers to connect to and recall personal experiences. In terms of availability to designers, food is a resource that is easy to obtain from supermarkets and grocery stores.

Manipulation of Physical Attributes

“Transforming the properties of raw ingredients to achieve the desired texture and preserving it until the food is about to be eaten can be challenging.” People manipulate physical attributes of food everyday in their kitchens, whether it’s a mother cooking dinner for her family, a 3-star Michelin chef at a restaurant, or a giant food manufacturer. “Whenever we prepare food, we put our own distinct stamp on it so that it has a particular texture and, with it, mouthfeel. This holds true both in home kitchens and in industrial plants.” Manipulation of foods’ physical attributes creates healthier relationships with food. Human’s food preferences are created early in life, however, they can still be adapted. Next, I will discuss several methods of transforming foods’ physical attributes.

Form

People can have certain preferences to food forms. For example, some people prefer eating apple slices versus trying to bite from a whole apple. The stress that is put on teeth can result in disliking a certain type of food because it requires

40 Schifferstein, "What design can bring to the food industry," 123.
41 Schifferstein, "What design can bring to the food industry," 123.
42 Schifferstein, "What design can bring to the food industry," 123.
more energy. Making relief cuts for teeth to sink into may lead to a better user experience, therefore increasing the liking of the food.

**Raw to Crispy**

There are several ways to achieve crispness such as frying and baking. However, the form of the food can also enhance the possibility of attaining crispness. One of the reasons potato chips are crispy besides the frying or baking is because they are sliced so thinly. This approach can be useful when dealing with foods that lack an interesting texture, making them more likely to be eaten.

**Hard to Soft**

Biting into a hard piece of food can trigger a negative experience. Hard foods can be cut up into smaller pieces, steamed, or sautéed to make them softer. Moreover, purees are another method of softening hard foods. However, purees can be disliked when connected to things such as baby food. To enhance the mouthfeel of purees, they can be put into a harder exterior, making the overall experience more enticing.

**Solid to Liquid**

Juicing has become a very popular method of fulfilling the daily requirements of fruits and vegetables. Moreover, the liquid extracted can be used on many form and not only as a beverage. One example is reconstituting it using additives to create a new form. Additives such as methylcellulose, xanthan gum, and pectin can be used to create a new mouthfeel that is not experienced when drinking a beverage. After incorporating the additives to the liquid, it can become a solid again, but with a more unique texture compared to the texture of the original ingredient. (Figure 9)\(^4^5\) shows pieces of apple fudge that was created by adding pectin to apple juice with red skins, which is then cooled until it is firm.

\(\text{Figure 9}\)

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Element of Surprise

Including an element of surprise in food and beverages can result in a positive or negative experience, either way it engages the consumer’s emotions more than other food experiences. One method of creating a surprising food experience is through spherification, which is transforming a liquid into the form of ball with a thin encasing, similar to caviar (Figure 10). When the consumer bites into it, they are surprised with a burst of juice.

Figure 10

This method can be applied to any form of liquid by using additives. Another example of surprising foods on the market are Jelly Beans’ variety of flavors. When biting into a piece of candy, you don’t really expect tasting buttered popcorn. Designers can consider creating surprising food experiences, possibly creating a better relationship with certain foods. These are only some of many methods of transforming foods’ physical attributes.

**Potential in Market**

Presently, consumers are increasingly trying to take charge of their health through maintaining a healthy diet and exercising. “There is a tremendous opportunity for food manufacturers and retailers to lead a healthy movement by providing the products and services that consumers want and need.”

47 43% of global respondents reported that the most desired food attributes are fresh, natural, and minimally processed.48 People are seeking foods that contain only natural ingredients the have not been genetically modified.49 This major shift in food behavior creates a great opportunity for designers to create desired food products that are healthy and to create a positive food experience for the user.

**Conclusion**

With the increase of processed food production that lacks nutritional value, yet is convenient, palatable, inexpensive, consumers are being increasingly affected by diseases such obesity, diabetes, and other chronic diseases. This has led to consumers wanting to take charge of their health, seeking food that have a better nutritional quality. Despite the lack of nutritional value that processed foods have, they still provide a unique sensorial experience to the consumer. These distinctive experiences influence food preferences. As designers, we are constantly trying to enhance user experiences. By recreating unique food experiences through food design, designers can create more desirable food products that have a better nutritional value than processed foods. “But first and foremost, knowledge of taste and especially mouthfeel can provide us with the tools for preparing healthier and tastier meals, strengthening the enjoyment and pleasure inherent in one of our most fundamental life forces: the need to eat.”

47 We Are What We Eat Healthy Eating Trends Around the World, 3
48 We Are What We Eat Healthy Eating Trends Around the World, 7
49 We Are What We Eat Healthy Eating Trends Around the World, 7
50 Mouritsen, Mouthfeel : How Texture Makes Taste, 309.
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